Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

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October 29, 2013

Mr. Sean Regan
Harvard University
46 Blackstone Street
Cambridge, MA 02139

RE: Cambridge
Transmittal No.: X252802
Application No.: NE-13-007
Class: *Operating Permit*
FMF No.: 382542
AIR QUALITY PLAN APPROVAL

Dear Mr. Regan:

The Massachusetts Department of Environmental Protection ("MassDEP"), Bureau of Waste Prevention, has reviewed your Non-major Comprehensive Plan Application ("Application") listed above. This Application concerns the proposed construction and operation of a new Combined Heat and Power system at your educational institution located at 46 Blackstone Street in Cambridge, Massachusetts ("Facility"). The system will consist of a combustion gas turbine and a heat recovery steam generator equipped with a duct burner. The Application bears the seal and signature of Andrew Jablonowski, Massachusetts Registered Professional Engineer number 39123.

This Application was submitted in accordance with 310 CMR 7.02 Plan Approval and Emission Limitations as contained in 310 CMR 7.00 "Air Pollution Control" regulations adopted by MassDEP pursuant to the authority granted by Massachusetts General Laws, Chapter 111, Section 142 A-J, Chapter 21C, Section 4 and 6, and Chapter 21E, Section 6. MassDEP's review of your Application has been limited to air pollution control regulation compliance and does not relieve you of the obligation to comply with any other regulatory requirements.

MassDEP has determined that the Application is administratively and technically complete and that the Application is in conformance with the Air Pollution Control regulations and current air pollution control engineering practice, and hereby grants this **Plan Approval** for said Application, as submitted, subject to the conditions listed below.

Please review the entire Plan Approval, as it stipulates the conditions with which the Facility owner/operator ("Permittee") must comply in order for the Facility to be operated in compliance with this Plan Approval.

1. DESCRIPTION OF FACILITY AND APPLICATION

Harvard University ("the Permittee") is an existing facility subject to the Operating Permit program at 310 CMR 7.00 – Appendix C. Its currently effective Final Operating Permit, application Transmittal #W050484, was issued April 13, 2011, and describes the existing equipment and contains all applicable Air Quality requirements to which the Permittee's Facility is subject. In accordance with 310 CMR 7.00, Appendix C(4)(b)2, the Permittee must submit a minor modification application to modify its Final Operating Permit to include the proposed combined heat and power (CHP) system and the applicable requirements described herein.

The proposed new CHP system ("CHP-1") includes a natural gas fired Solar Taurus 70 combustion gas turbine-generator ("CTG-1") set maximum rated at 8.84 megawatts electric power output, with thermal energy recovered from the CTG-1 exhaust gases in a heat recovery steam generator ("HRSG"), which is equipped with one duct burner ("DB-1") with a maximum energy input rating of 51,030,000 British thermal units per hour (Btu/hr). The CTG-1 shall combust natural gas as its primary fuel, and ultra low sulfur diesel fuel oil (ULSD) with a maximum sulfur content of 0.0015 percent, by weight, as its back-up fuel; DB-1 shall combust natural gas only.

The new CTG-1 is subject to Industry Performance Standards in Regulation 310 CMR 7.26(43) Engines and Turbines and (45) Combined Heat and Power (CHP). As shown in Table A below, Regulation 310 CMR 7.26(43) sets emissions limitations that must be met by the new CTG-1 for the following air contaminants: nitrogen oxides ("NO_x"), carbon monoxide ("CO"), carbon dioxide ("CO_2") and ammonia ("NH3"); volatile organic compounds ("VOC") emissions must comply with Best Available Control Technology ("BACT").

Regulation 310 CMR 7.26(45) provides a formula to calculate emission reduction credits for NO_x, CO, and NH3. These emission credits are used to represent the displaced fuel burning that would otherwise be necessary to supply the thermal energy which the proposed CHP system would supply. The emission credits may be used to determine compliance of the new CTG-1 with the 310 CMR 7.26(43) emission limitations. Pursuant to 310 CMR 7.26(45)(b)7., the emissions determined by this methodology satisfy the requirements of 310 CMR 7.02(8)(a)2., BACT.

Table A
CHP-1 Emission Reduction Credits and ERP Compliance Demonstration

EU#	Air Contaminant	Emission Limit 310 CMR 7.26(43) lbs/MWh		Application Calculated Emission Credits per 310 CMR 7.26(45)	Converted Emission Limit for CHP purposes of 310 CMR 7.26(45) lbs/MWh	
		Gas	Oil		Gas	Oil
CTG-1	NO_x	0.14	0.34	0.171	0.311	0.511
	CO	0.09	0.18	0.391	0.481	0.571
	VOC	0.029*	0.041*	NA	NA	NA
	NH3	0.030**	0.032**	0.004	0.034	0.036
	CO_2	1650		NA	NA	
	Smoke & Opacity	Not to exceed the limits contained in 310 CMR 7.26(43)(d)4., which references 310 CMR 7.06(1)(a) & (b)				

Table A Note 1: The Table A emission calculations are used to determine the emission limits found in Table 2 below.
Table A Key:
* VOC emission limit is based on top-case BACT requirement.
** Ammonia emission limit is based on the ERP 310 CMR 7.26(43) regulations for turbines with selective catalytic reduction.
BACT = Best Available Control Technology
EU# = Emission Unit Number
CHP-1 = Combined heat and power system, including CTG-1 and DB-1
CTG-1 = combustion gas turbine
DB-1 = duct burner
NH_3 = ammonia
NO_x = Nitrogen Oxides
CO = Carbon Monoxide
CO_2 = Carbon Dioxide
lbs/MWh = pounds per megawatt per hour
NA = not applicable
ERP = Industry Performance Standards at 310 CMR 7.26(43) and (45)

The CTG-1 and DB-1 are subject to the requirements of 310 CMR 7.02(8)(a)2., BACT. BACT emission limitations may not be less stringent than any 310 CMR 7.26 standards in Table A above or NSPS standards in Table B below. The Permittee proposes to achieve the required emission limitations by the following means: use of Selective Catalytic Reduction ("SCR") for control of NO_x; use of an oxidation catalyst for control of VOC, CO, and Hazardous Air Pollutants ("HAPs"); and efficient CTG-1 and DB-1 design for control of CO_2. The associated emissions and operating limits are contained in Section 3.A, beginning on Page 6 of 18 below.

New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAPs) Applicability Analysis

The new CTG-1 and DB-1 are subject to the requirements of 40 CFR Part 60 Subpart KKKK—Standards of Performance for Stationary Combustion Turbines. The Subpart KKKK emission limits for NO_x and SO_2 are listed in Table B below.

Table B
40 CFR 60 Subpart KKKK Limits

EU#	Operational / Production Limit	Air Contaminant	Emission Limit			
			ppmvd		lbs/MWh	
CTG-1, DB-1	The Permittee must, to the extent practicable, maintain and operate the turbine in a manner consistent with good air pollution control practice for minimizing emissions.	NO_x	natural gas	ULSD	natural gas	ULSD
			25	74	1.2	3.6
		SO_2	0.060 lb/mmBtu			

Table B Key:
EU# = Emission Unit Number
NO_x = Nitrogen Oxides
CO = Carbon Monoxide
lbs/MWh = pounds per megawatt per hour
lb/mmBtu = pounds per million British thermal units
ppmvd = parts per million in dry gas referenced to 15 percent oxygen

Since DB-1 meets the requirements of subpart KKKK, DB-1 is not subject to NSPS Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units.

CTG-1 is not subject to 40 CFR Part 63 Subpart YYYY - National Emissions Standards for Hazardous Air Pollutants (HAPs) for Combustion Turbines, because this subpart applies only to major sources of HAPs.

DB-1 is not subject to 40 CFR Part 63 Subpart JJJJJJ - National Emissions Standards for Hazardous Air Pollutants (HAPs) for Industrial, Commercial, and Institutional Boilers Area Sources, because this subpart does not apply to units that combust natural gas only.

Prevention of Significant Deterioration ("PSD") Applicability Analysis

The existing Facility's potential-to-emit exceeds 100 tons per year for: NOx, sulfur dioxide ("SO_2") and CO. Therefore, the Facility is classified as an existing "major" source for the purpose of PSD review per 40 CFR 52.21.

The Facility-wide potential and the PSD significance levels and the proposed allowable emissions from the new CHP-1 are contained in Table C below:

Table C – Prevention of Significant Deterioration Regulations Threshold Evaluation			
Pollutant	**Facility-wide Potential Emissions in tons per year**	**40 CFR 52.21 Significance Levels in tons per year**	**Proposed Allowable Emissions of CHP-1 in tons per year**
GHG— CO_2e	>100,000*	75,000	69,600
Carbon Monoxide (CO)	428	100	10.3
Nitrogen Oxides (NO_x)	1675	40	7.6
Sulfur Dioxide (SO_2)	1728	40	1.7
Particulate Matter under 10 microns (PM_{10})	206	15	9.8
Particulate Matter under 2.5 microns ($PM_{2.5}$)	206	10	9.8
Volatile Organic Compounds (VOC)	54	40	8.2

Table C Key:
GHG = Total Greenhouse Gases
CO_{2e} = Carbon Dioxide equivalent
*Combined 2012 actual CO_{2e} emissions obtained from the Massachusetts Greenhouse Gas Emissions Reporting Program for the Permittee's Blackstone Station are 59,546 tons and for the Cambridge-Allston Campus are 14,978 tons; therefore, Facility-wide potential CO_{2e} emissions are greater than 100,000 tons per year.

Construction and operation of CHP-1 will not result in emissions increases from changes in operation of any existing equipment at the Facility. Emissions increases at the Facility consist solely of CHP-1's allowable emissions. Therefore, the allowable emissions from CHP-1 will not result in a "significant" emissions increase, and CHP-1 is not subject to PSD review.

Nonattainment Review – 310 CMR 7.00: Appendix A Applicability Analysis
The existing, Facility-wide, potential-to-emit exceeds 50 tons per year for NO_x and VOC. As a result, the Facility is classified as an existing major source for the purpose of Emissions Offset and Nonattainment Review per 310 CMR 7.00: *Appendix A* Applicability of Offsets and Nonattainment Review ("Appendix A"). Therefore, a net emissions increase determination for NO_x and VOC is required as per Appendix A. The net emissions increases of NOx and VOC can then be compared to the "significant" emissions increase level of 25 or more tons per year as contained in Appendix A.

The proposed allowable NO_x and VOC emissions from CHP-1 are contained in Table D below:

Table D – CHP-1 Proposed Allowable NO_x and VOC Emissions	
Pollutant	**Emissions in tons per year**
NO_x	7.6
VOC	8.2

Since the proposed allowable emissions of NO_x and VOC from CHP-1 are less than the significant threshold of 25 tons per year, the CHP system is not subject to Emissions Offsets and Nonattainment review pursuant to Appendix A.

Air Quality Modeling
In accordance with 310 CMR 7.26(43)(d)3.d., the Permittee's air quality modeling analysis, using the USEPA approved computer dispersion model AERMOD, predicted that the operation of CHP-1 will not cause an exceedance of any National Ambient Air Quality Standard.

2. EMISSION UNIT IDENTIFICATION

Each Emission Unit (EU) identified in Table 1 is subject to and regulated by this Plan Approval:

Table 1

EU#	Description	Design Capacity	Pollution Control Device ("PCD")
CTG-1	Solar Taurus 70 Combustion gas turbine	98.1 MMBtu/hr on gas, 93.23 MMBtu/hr on ULSD, 8.84 Megawatts	PCD-1, Selective Catalytic Reduction ("SCR") and PCD-2, Oxidation Catalyst
DB-1	Duct Burner	51.03 MMBtu/hr	

Table 1 Key:
EU# = Emission Unit Number
CTG-1 = combustion turbine
DB-1 = duct burner
MMBtu/hr = Million British thermal units per hour heat input
ULSD = ultra low sulfur diesel fuel oil with a maximum sulfur content of 0.0015 percent, by weight.

3. APPLICABLE REQUIREMENTS

A. OPERATIONAL, PRODUCTION and EMISSION LIMITS

The Permittee is subject to, and shall not exceed the Operational, Production, and Emission Limits as contained in Table 2:

Table 2
Approved BACT Emission Limits

EU#	Operational / Production Limit	Air Contaminant	Emission Limit (Notes 1 and 2)	
			Short-term	Long-term
			lbs/hr	TPY
CTG-1 DB-1	Natural gas with or without duct burner firing.	NO_x	3.3	7.6
		CO	6.0	10.3
		CO_2	17,400	69,600
		VOC	2.0	8.2
		$PM/PM_{10}/PM_{2.5}$	3.3	9.8

Table 2
Approved BACT Emission Limits

EU#	Operational / Production Limit	Air Contaminant	Emission Limit (Notes 1 and 2)	
			Short-term	Long-term
			lbs/hr	TPY
CTG-1 DB-1	Natural gas with or without duct burner firing.	SO_2	0.43	1.7
		NH_3	0.44	1.6
		Smoke & Opacity	Not to exceed the limits contained in 310 CMR 7.26(43)(d)4., which references 310 CMR 7.06(1)(a) & (b)	
	ULSD, No duct burner firing, Maximum ULSD usage is not to exceed 490,320 gallons per 12-month rolling period.	NO_x	4.3	See Note 1 and Note 2
		CO	4.8	
		CO_2	15,200	
		VOC	0.34	
		PM	3.7	
		SO_2	0.14[3]	
		NH_3	0.31	
		Smoke & Opacity	Not to exceed the limits contained in 310 CMR 7.26(43)(d)4., which references 310 CMR 7.06(1)(a) & (b)	

Table 2 Notes:
Note 1: The short-term emission limits are determined using emission credits calculated from the Combined Heat and Power Regulation at 310 CMR 7.26(45).
Note 2: The long-term emission limits are determined using the BACT requirements for a CTG-1 and DB-1 without the use of said emission credits. The long-term emission limits are calculated based on the fuel usage rate of 8,040 hours per 12-month rolling period while firing natural gas and 720 hours per 12-month rolling period while firing ULSD.
Note 3: Sulfur dioxide emissions are based on natural gas firing of CTG-1 only. DB-1 does not combust ULSD.
Table 2 Key:
EU# = Emission Unit Number
NO_x = Nitrogen Oxides
CO = Carbon Monoxide
SO_2 = Sulfur Dioxide
PM/PM10/PM2.5 = Total particulate matter/particulates which have particle sizes less than or equal to 10 microns/ particulates which have particle sizes less than or equal to 2.5 microns ($PM_{2.5}$), including filterable and condensable
VOC = Volatile Organic Compounds
CO_2 = Carbon Dioxide
NH_3 = Ammonia
TPY = Tons per consecutive12-month period
lbs/hr = Pounds per hour
ULSD = Ultra low sulfur diesel fuel oil with a maximum sulfur content of 0.0015 percent, by weight.

B. NOISE

Background sounds were monitored at several representative locations that surround the CHP-1 site. In general, monitoring locations were selected on the basis of where sound impact from CHP-1 was anticipated to be greatest. A review of the existing land use in the vicinity of the CHP-1 site was conducted to identify the closest and most representative inhabited residential locations. An existing condition sound level measurement study was conducted for the CHP expansion between Tuesday, October 23 and Friday, November 2, 2012. It included 240 hours of long term sound level measurements at the west and south property lines, and 20-minute daytime and nighttime measurements at Blackstone Street, Western Avenue, and the intersection of Hingham Street and Elmer Street.

The monitors were programmed to record the following hourly A-weighted sound levels: $L_{10,}$ L_{50}, L_{90} and L_{eq} percentile sound levels, and the energy average sound level L_{eq}. A-weighted sound level, which is reported in decibels, designated as "dBA", emphasizes the middle frequency sounds to which the human ear is most sensitive and de-emphasizes lower and higher frequency sounds. The L_{90} level represents the sound level exceeded 90 percent of the time and is used by MassDEP for the regulation of noise emissions.

1. The Permittee shall take necessary precautions to insure that the Facility complies with MassDEP's noise regulation and policy and that the Facility does not cause a condition of air pollution.

2. The Permittee shall perform, at a minimum, the following measures or equivalent alternative measures for noise mitigation:

    a) CTG-1 shall be installed in gas turbine/generator enclosure of the existing Harvard Blackstone Facility.

    b) Silencers shall be installed on the combustion turbine air intake, turbine enclosure intake vent, turbine enclosure discharge vent, generator intake vent and generator discharge vent.

    c) The natural gas compressor shall be installed and located inside the existing boiler room to reduce sound levels.

3. MassDEP Noise Policy 90-001 limits increases over the existing L_{90} background level to 10 dBA. Additionally, "pure tone" sounds, defined as any octave band level that exceeds the levels in adjacent octave bands by 3 dBA or more, are also prohibited. The Permittee, at a minimum, shall ensure that the proposed CHP-1 complies with said Policy.

4. The allowable noise levels generated from the operation of CHP-1 by the Permittee are summarized in Table 2A of this Approval. Further, based on the noise frequency

distribution, no combination of sound sources shall result in a "pure tone condition," as previously defined.

TABLE 2A			
Noise Location	**Nighttime Ambient (L_{90}, dBA)[6]**	**Total Future Maximum Predicted Plant Generated Noise (Nighttime Levels) (L_{90},dBA)**	**Predicted Increase over Nighttime Baseline (L_{90},dBA)**
R-1[1]	50	52	2
R-2[2]	51	52	1
R-5[3]	44	45	0
R-6[4]	55	62	7
R-4[5]	54	57	3

Table 2A Notes:
1. R-1 is located along Blackstone Street, in front of the nearest residential building east of the Facility.
2. R-2 is located at 387-389 Western Avenue, in front of the closest residential building north of the Facility.
3. R-5 is located at 19 Hingham Street, representative of the residential neighborhood north of the Facility.
4. R-6 represents the location west of the property that is the pedestrian walkway along the eastern bank of the Charles River (directly across Memorial Drive from CHP-1).
5. R-4 represents property line location south of the Facility.
6. The lowest background sound levels (one hour) observed where the noise level is exceeded 90 percent of the time (L_{90}), which is the level regulated by the MassDEP Noise Policy.

C. COMPLIANCE DEMONSTRATION

The Permittee is subject to, and shall comply with, the monitoring, testing, record keeping, and reporting requirements as contained in Tables 3, 4, and 5 below:

Table 3	
EU#	**Monitoring and Testing Requirements**

Table 3	
EU#	**Monitoring and Testing Requirements**
CHP-1, PCD-1, PCD-2	1) The Permittee shall continuously monitor the air emissions for NO_x, CO, NH_3 and O2 as a diluent gas by installing, calibrating, maintaining and operating a continuous emission monitoring system (CEMS) to determine the hourly NOx, CO, and NH_3 emission rate in pounds per hour (lb/hr). The Permittee shall maintain and operate the CEMS pursuant to 40 CFR 60, New Source Performance Standards (NSPS), Subpart KKKK, Monitoring of Operations for Stationary Gas Turbines, as applicable.
	2) The Permittee shall continuously monitor the opacity by installing, calibrating, maintaining and operating a continuous opacity monitoring system (COMS), based on one-minute averages. The Permittee shall operate the COMS serving CHP-1 at all times except for periods of COMS calibration checks, zero and span adjustments, preventative maintenance, and periods of unavoidable malfunction.
	3) The Permittee shall conduct compliance testing on applicable unit for NO_x, CO, VOC, NH_3 and $PM_{2.5}$ to demonstrate compliance with the emission limitations as specified in Table 2 above when combusting natural gas and ULSD. The Permittee shall complete all compliance testing of applicable unit within 180 days of initial CHP-1 start-up.
	4) The Permittee shall operate the CEMS serving CHP-1 at all times, including startup and shutdown periods, except for periods of CEMS calibration checks, zero and span adjustments, preventative maintenance, and periods of unavoidable malfunction.
	5) The Permittee shall certify the CEMS during the initial certification in accordance with 40 CFR Part 60 Appendix B and ongoing compliance shall be demonstrated in accordance with 40 CFR Part 60 Appendix F, except as follows: A RATA for the NOx, CO and O2 CEMS shall be conducted at least once every four QA operating quarters but no less frequently than once every eight calendar quarters. If RATA testing is not completed within this timeframe, a 720 unit operating hour grace period may be used, as provided in 40 CFR 75 App. B, §2.3.3. A cylinder gas audit (CGA) for the NOx, CO, and O2 CEMS shall be conducted at least once every QA operating quarter but no less frequently than once every four calendar quarters. If CGA testing is not completed within this timeframe, a 168 unit operating hour grace period may be used, as provided in 40 CFR 75, Appendix B §2.2.4. QA operating quarter means a calendar quarter in which there are at least 168 unit operating hours. Unit operating hour means a clock hour during which a unit combusts any fuel, either for part of the hour or for the entire hour. It is not necessary to calibrate the CEMS and COMS during calendar days in which the respective unit does not operate.
	6) The Permittee shall certify the COMS during the initial certification in accordance with 40 CFR Part 60 Appendix B, Performance Specification 1 and ongoing compliance shall be demonstrated in accordance with the COMS manufacturer's standard operating and maintenance procedures.
	7) CHP-1 shall be constructed to accommodate the emissions testing requirements as stipulated in 40 CFR Part 60, Appendix A or the latest test methods recommended by USEPA.

Table 3	
EU#	**Monitoring and Testing Requirements**
CHP-1, PCD-1, PCD-2	8) If and when MassDEP requires it, the Permittee shall conduct emission testing in accordance with USEPA Reference Test Methods and Regulation 310 CMR 7.13.
	9) The Permittee shall monitor all operations to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	10) The Permittee shall conduct a noise survey (during daytime and nighttime operation), which is in accordance with MassDEP guidelines, to demonstrate that the noise impacts from the operation of the subject equipment are in compliance with Regulation 310 CMR 7.10 and the Bureau of Waste Prevention's Noise Policy No. 90-001 (copy attached). This survey shall be conducted within 45 days of the commencement of continuous operation of CHP-1.
	11) The Permittee shall use and maintain its CEMS and COMS as "direct-compliance" monitors to measure NO_x, CO, NH_3, oxygen and opacity. "Direct-compliance" monitors generate data that legally documents the compliance status of the Facility. MassDEP will utilize the data generated by the "direct-compliance" monitors for compliance and enforcement purposes.
	12) CTG-1 and DB-1 shall each be equipped with a fuel meter, for each fuel of use, and recorder; and all fuel usage shall be monitored.
	13) The Permittee shall install and operate continuous sensors and alarm systems to monitor temperatures at the inlet to PCD-1 and PCD-2.
	14) The Permittee shall install, calibrate, test and operate a Data Acquisition and Handling System(s) (DAHS) for the CEMS and COMS serving CHP-1 and associated air pollution control system operating parameters which shall monitor the following emissions: a) Oxygen (O_2) b) Oxides of Nitrogen (NO_x) c) Carbon Monoxide (CO) d) Ammonia (NH_3) e) Opacity
	15) The Permittee shall complete initial air emissions testing of CHP-1 for total particulates including $PM_{2.5}$ while CHP-1 combusts both natural gas and ULSD. Subsequently, the Permittee shall perform $PM_{2.5}$ air emission testing on an annual basis for four additional years, including natural gas testing each year and concurrent ULSD testing after 720 oil-fired operating hours have elapsed subsequent to the initial compliance test. If any of these test results exceed 50 percent of the $PM_{2.5}$ short-term emission limit, then the test schedule shall continue until and if five consecutive calendar years demonstrate emissions are less than 50 percent of the short-term $PM_{2.5}$ emission limit.

Table 3 Key:
EU# = Emission Unit Number
NO_x = Nitrogen Oxides
CO = Carbon Monoxide
VOC = Volatile Organic Compounds
CEMS = Continuous Emissions Monitoring System
COMS = Continuous Opacity Monitoring System
QA = Quality Assurance Procedures
RATA – Relative Accuracy Test Audit
USEPA = United States Environmental Protection Agency

Table 4

EU#	Record Keeping Requirements
CHP-1, PCD-1, PCD-2 CHP-1, PCD-1, PCD-2	1) The Permittee shall continuously record the emissions of NO_x, CO, NH_3 and O2 as a diluent gas.
	2) The Permittee shall continuously record opacity via the one-minute block averages.
	3) The Permittee shall maintain all records generated by its Data Acquisition and Handling System(s) (DAHS) for the CEMS and COMS serving CHP-1, including associated air pollution control system operating parameters and the following: a) Oxygen (O_2) b) Oxides of Nitrogen (NO_x) c) Carbon Monoxide (CO) d) Ammonia (NH_3) e) Opacity
	4) The Permittee shall compile the startup and shutdown emissions data records for NO_x, CO and opacity to be used to determine the startup and shutdown limits for CHP-1. Emission data generated from this compilation shall be made available for review by MassDEP prior to determining and approving the maximum allowable emissions, including opacity limits, for these periods of time. MassDEP will incorporate these limits into the Test Approval for CHP-1 and upon issuance such limits shall be considered enforceable.
	5) All periods of excess emissions from the subject equipment, even if attributable to an emergency/malfunction or start up/shutdown, shall be quantified and included by The Permittee in the determination of rolling 12-month period emissions and compliance with the rolling 12-month period emission limitations as stated in Table 2 of this Plan Approval. (**"Excess Emissions"** are defined as emissions, which are in excess of the short-term emission limitations as stipulated in Table 2.).
	6) The Permittee shall maintain adequate records on-site to demonstrate compliance with all operational, production, and emission limits contained in Table 2 above. Records shall also include the actual emissions of air contaminant(s) emitted for each calendar month and for each consecutive twelve-month period (current month plus prior eleven months). These records shall be compiled no later than the 15th day following each month. An electronic version of the MassDEP approved record keeping form, in Microsoft Excel format, can be downloaded at http://www.mass.gov/dep/air/approvals/aqforms.htm#report .
	7) The Permittee shall maintain records of all monitoring, testing and fuel usage as required by Table 3.
	8) The Permittee shall maintain a copy of this Plan Approval, underlying Application and the most up-to-date SOMP for the EU(s) and PCD(s) approved herein on-site.
	9) The Permittee shall maintain a record of routine maintenance activities performed on the approved EU(s), PCD(s) and monitoring equipment. The records shall include, at a minimum, the type or a description of the maintenance performed and the date and time the work was completed.
	10) The Permittee shall maintain a record of all malfunctions affecting air contaminant emission rates on the approved EU(s) and PCD(s) and monitoring equipment. At a minimum, the records shall include: date and time the malfunction occurred; description of the malfunction; corrective actions taken; the date and time corrective actions were initiated and completed; and the date and time emission rates and monitoring equipment returned to compliant operation.

Table 4	
EU#	**Record Keeping Requirements**
	11) The Permittee shall maintain records to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	12) The Permittee shall maintain records required by this Plan Approval on-site for a minimum of five (5) years.
	13) The Permittee shall make records required by this Plan Approval available to MassDEP and USEPA personnel upon request.

Table 4 Key:
EU# = Emission Unit Number
PCD = Pollution Control Device
SOMP = Standard Operating and Maintenance Procedure
USEPA = United States Environmental Protection Agency
CEMS = Continuous Emissions Monitoring System
COMS = Continuous Opacity Monitoring System

Table 5	
EU#	**Reporting Requirements**
CHP-1, PCD-1, PCD-2	1) The Permittee shall submit to MassDEP all information required by this Plan Approval over the signature of a "Responsible Official" as defined in 310 CMR 7.00 and shall include the Certification statement as provided in 310 CMR 7.01(2)(c).
	2) The Permittee shall notify the Northeast Regional Office of MassDEP, BWP Permit Chief by email at NERO.Air@massmail.state.ma.us or fax at 978-694-3499, as soon as possible, but no later than three (3) business day after discovery of an exceedance(s) of Table 2 requirements. A written report shall be submitted to Permit Chief at MassDEP within ten (10) business days thereafter and shall include: identification of exceedance(s), duration of exceedance(s), reason for the exceedance(s), corrective actions taken, and action plan to prevent future exceedance(s).
	3) The Permittee shall report annually to MassDEP, in accordance with 310 CMR 7.12, all information as required by the Source Registration/Emission Statement Form. The Permittee shall note therein any minor changes (under 310 CMR 7.02(2)(e), 7.03, 7.26, etc.), which did not require Plan Approval.
	4) The Permittee shall provide a copy to MassDEP of any record required to be maintained by this Plan Approval within 30-days from MassDEP's written request.
	5) A test protocol, describing the test methods for NO_x, CO, VOC, $PM_{2.5}$ and NH_3 compliance testing and procedures for NO_x, CO, VOC, $PM_{2.5}$ and NH_3 optimization/ minimization, sampling point locations, sampling equipment, sampling and analytical procedures, and the operating conditions for the required testing must be submitted to this Office, attention Bureau of Waste Prevention Permit Chief, for review and MassDEP approval at least 30 days prior to the commencement of compliance testing at the facility. Startup and shutdown testing procedures shall also be included in this protocol.
	6) The Permittee shall submit to MassDEP a final stack emission test results report, within 60 days after emission testing, for emission testing as defined in Table 3 Monitoring and Testing Requirements.
	7) The results of the conducted noise survey (during daytime and nighttime operation), shall be submitted to this Office, in writing, attention Permit Chief, Bureau of Waste Prevention, within 75 days of the commencement of continuous operation of the subject equipment.
	8) The Permittee shall comply with all applicable reporting requirements of the federal regulation 40 CFR 60, Subpart KKKK, such as written advance notification of start-up, post-notification of actual start-up and semi-annual excess emissions reports.

Table 5	
EU#	**Reporting Requirements**
	9) A quality assurance/quality control (QA/QC) program must be developed for the long-term operation of the CEMS and COMS serving CHP-1. The QA/QC program must be submitted in writing for review and approval by MassDEP at least 30 days prior to commencement of CHP-1 operation. Any subsequent changes to the program shall be approved by MassDEP.
	10) The preliminary Standard Operating and Maintenance Procedures (SOMP) shall be submitted to this Office by the Permittee within 30 days of completion of construction of the subject equipment.
	11) The Permittee shall submit the Final SOMP concerning the subject equipment to this Office, attention Permit Chief, Bureau of Waste Prevention, within 60 days of completion of the required initial compliance testing of the subject equipment. The Final SOMP shall include standard operating and maintenance procedures for CHP-1 and the associated PCD-1 and PCD-2 systems.
	12) The Permittee shall submit any subsequent revision(s) made to the Final SOMP concerning the subject equipment, to this Office, attention Permit Chief, Bureau of Waste Prevention, within 15 days of said revision(s).

Table 5 Key:
EU# = Emission Unit Number

4. SPECIAL TERMS AND CONDITIONS

A. The Permittee is subject to, and shall comply with, the Special Terms and Conditions as contained in Table 6 below:

Table 6	
EU#	**Special Terms and Conditions**
CHP-1, PCD-1, PCD-2	1) A copy of this Approval letter and the Standard Operating and Maintenance Procedure for the subject CHP-1, PCD-1 and PCD-2 equipment shall be affixed at or adjacent to the subject equipment.
	2) PCD-1 and PCD-2 shall operate whenever CHP-1 is operated, including start-up and shutdown, except that PCD-1 shall be placed in operation only after the exhaust gas temperature across the PCD-1 reaches approximately 550 degrees F.
	3) The emission limits established in Table 2 shall apply only when CHP-1 is operated within the 50 percent to 100 percent load range, excluding start-up or shut down periods. Compliance with these emission limitations shall be determined based on one-hour averages; except opacity limitations shall be determined based on one-minute averages.
	4) The Permittee shall not operate CHP-1 at power generating loads below 50 percent of combustion turbine rated capacity or power generating loads exceeding 100 percent of combustion turbine rated capacity, excluding start-up or shutdown periods. CHP-1 start-ups and shutdowns shall be conducted as per turbine manufacturers' specifications, but shall not exceed two hours in duration for each episode.
	5) CHP-1 shall comply with all applicable sections of 40 CFR Part 60 – New Source Performance Standards – Subpart KKKK (Gas Turbines).
	6) The Permittee shall comply with all applicable requirements of Regulation 310 CMR 7.26(43) and (45) for CHP-1.

Table 6	
EU#	**Special Terms and Conditions**
	7) Natural gas shall be the primary fuel of use in the CTG-1 and ULSD shall be its back-up fuel of use. The CTG-1 shall run on ULSD for no more than 720 hours per 12-month calendar period. ULSD shall not be fired during the ozone season (May 1 through September 30), unless the natural gas supplier physically curtails the natural gas service, or the gas compression system installed at the Facility is inoperable during this May through September period. Natural gas shall be the only fuel of use in DB-1.
	8) Any net NO_x and /or VOC emissions increase occurring over a period of five consecutive calendar years, commencing with initial start-up of CHP system, which equates to 25 or more tons of NO_x and/or VOC shall become subject to Nonattainment Review, as per the requirements of 310 CMR 7.00: Appendix A.
	9) The Permittee shall operate the subject equipment consistent with the Final SOMP and the conditions/parameters established during the compliance test program
	10) In accordance with 310 CMR 7.00, Appendix C(4)(b)2, the Facility shall submit an Operating Permit Minor Modification application (BWP AQ 10) that reflects this Plan Approval and any other requirements that apply to the Facility within 90 days from the date of this Plan Approval.

Table 6 Key:
EU# = Emission Unit Number
ULSD = ultra low sulfur diesel fuel oil with a maximum sulfur content of 0.0015 percent, by weight
CHP-1 = combined heat and power system, including CTG-1 and DB-1
DB-1 = duct burner
HRSG – heat recovery steam generator
PCD-1 = Selective catalytic reduction
PCD-2 = oxidation catalyst
CTG-1 = combustion gas turbine

B. The Permittee shall install and use an exhaust stack, as required in Table 7, on the Emission Units that is consistent with good air pollution control engineering practice and that discharges so as to not cause or contribute to a condition of air pollution. The exhaust stack shall be configured to discharge the gases vertically and shall not be equipped with any part or device that restricts the vertical exhaust flow of the emitted gases, including but not limited to rain protection devices known as "shanty caps" and "egg beaters."

C. The Permittee shall install and utilize an exhaust stack with the following parameters, as contained in Table 7, for the Emission Units that are regulated by this Plan Approval:

Table 7				
EU#	**Stack Height Above Ground (feet)**	**Stack Inside Exit Dimensions**	**Stack Gas Exit Velocity Range (feet per second)**	**Stack Gas Exit Temperature Range (^oF)**
CHP-1	110	4.1 feet	51 to 101	316 to 358

Table 7 Key:

EU# = Emission Unit Number
CHP-1 = combined heat and power system, including CTG-1 and DB-1
CTG-1 = combustion gas turbine
DB-1 = duct burner
^{o}F = Degree Fahrenheit
Stack gas exit velocity and temperature is based on when natural gas is being fired by the CTG-1 and DB-1.

5. GENERAL CONDITIONS

The Permittee is subject to, and shall comply with, the following general conditions:

A. Pursuant to 310 CMR 7.01, 7.02, 7.09 and 7.10, should any nuisance condition(s), including but not limited to smoke, dust, odor or noise, occur as the result of the operation of the Facility, then the Permittee shall immediately take appropriate steps including shutdown, if necessary, to abate said nuisance condition(s).

B. If asbestos remediation/removal will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that all removal/remediation of asbestos shall be done in accordance with 310 CMR 7.15 in its entirety and 310 CMR 4.00.

C. If construction or demolition of an industrial, commercial or institutional building will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that said construction or demolition shall be done in accordance with 310 CMR 7.09(2) and 310 CMR 4.00.

D. Pursuant to 310 CMR 7.01(2)(b) and 7.02(7)(b), the Permittee shall allow MassDEP and / or USEPA personnel access to the Facility, buildings, and all pertinent records for the purpose of making inspections and surveys, collecting samples, obtaining data, and reviewing records.

E. This Plan Approval does not negate the responsibility of the Permittee to comply with any other applicable Federal, State, or local regulations now or in the future.

F. Should there be any differences between the Application and this Plan Approval, the Plan Approval shall govern.

G. Pursuant to 310 CMR 7.02(3)(k), MassDEP may revoke this Plan Approval if the construction work is not commenced within two years from the date of issuance of this Plan Approval, or if the construction work is suspended for one year or more.

H. This Plan Approval may be suspended, modified, or revoked by MassDEP if MassDEP determines that any condition or part of this Plan Approval is being violated.

I. This Plan Approval may be modified or amended when in the opinion of MassDEP such is necessary or appropriate to clarify the Plan Approval conditions or after consideration of a written request by the Permittee to amend the Plan Approval conditions.

J. The Permittee shall conduct emission testing, if requested by MassDEP, in accordance with USEPA Reference Test Methods and regulation 310 CMR 7.13. If required, a pretest protocol report shall be submitted to MassDEP at least 30 days prior to emission testing and the final test results report shall be submitted within 60 days after emission testing.

K. Pursuant to 310 CMR 7.01(3) and 7.02(3)(f), the Permittee shall comply with all conditions contained in this Plan Approval. Should there be any differences between provisions contained in the General Conditions and provisions contained elsewhere in the Plan Approval, the latter shall govern.

6. MASSACHUSETTS ENVIRONMENTAL POLICY ACT

MassDEP has determined that the filing of an Environmental Notification Form (ENF) with the Secretary of Energy & Environmental Affairs, for air quality control purposes, was not required prior to this action by MassDEP. Notwithstanding this determination, the Massachusetts Environmental Policy Act (MEPA) and 301 CMR 11.00, Section 11.04, provide certain "Fail-Safe Provisions," which allow the Secretary to require the filing of an ENF and/or an Environmental Impact Report (EIR) at a later time.

7. APPEAL PROCESS

This Plan Approval is an action of MassDEP. If you are aggrieved by this action, you may request an adjudicatory hearing. A request for a hearing must be made in writing and postmarked within twenty-one (21) days of the date of issuance of this Plan Approval.

Under 310 CMR 1.01(6)(b), the request must state clearly and concisely the facts, which are the grounds for the request, and the relief sought. Additionally, the request must state why the Plan Approval is not consistent with applicable laws and regulations.

The hearing request along with a valid check payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100.00) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

This request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below. The filing fee is not required if the appellant is a city or

town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority.

MassDEP may waive the adjudicatory hearing-filing fee for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file, together with the hearing request as provided above, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

Enclosed is a stamped approved copy of the application submittal.

Should you have any questions concerning this Plan Approval, please contact Joseph Su by telephone at 978-694-3200, or in writing at the letterhead address.

Very truly yours,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

Joseph Su
Environmental Engineer
Bureau of Waste Prevention

James E. Belsky
Permit Chief
Bureau of Waste Prevention

ecc: Cambridge Board of Health
Cambridge Fire Department
MassDEP/Boston - Yi Tian